Introductory Comments

Please amend the specification in the manner indicated below. In the following amendments, an underline is used to indicate new text, and strikeouts are used to indicate deleted text. The amendments to the specification were made to correct minor typographical errors. The amendments to the specification are supported in the original application as filed. Moreover, Applicant submits that no new matter is added by the above amendments. Amendments have also been made to certain of the drawings, as discussed below, to make the callouts in the figures in agreement with those in the specification. Any callouts added to the drawings are contained in the specification. Therefore, no new matter has been added to the drawings.

The amendments are made with reference to published application US 2002/0191808 A1. The paragraph numbering below corresponds to the paragraph numbering in the published application.

Specification Amendments

Please replace paragraph 0011 with the amended paragraph, as follows:

[0011] As mentioned, a second category of planar-magnetic speakers comprises single-ended devices. With reference to FIG. 2, a typical conventional single-ended speaker configuration, having a flexible diaphragm 17 with a number of conductive elements 18, is set forth by way of example. The diaphragm is tensioned and supported by frame members (not shown) carried by a substrate 19 of the frame, and which frame members extend outward (upward in the figure) beyond the top of a single array of magnets ~~20~~ <u>35</u> to position the diaphragm an offset distance away from the tops of the magnets to accommodate vibration of the diaphragm. The array provides a fixed magnetic field with respect to the coil conductors 18 disposed on the diaphragm. It will be apparent that the single array of magnets (typically of ceramic or rubberized ferrite composition) provides a much-reduced energy field, compared to the previously discussed push-pull device, assuming comparable magnets are used. Because of this and other reasons, previous

single-ended devices of compact size have not provided performance that has been deemed acceptable for commercial applications.

Please replace paragraph 0017 with the amended paragraph, as follows:

[0017] Further, in contrast with standard, dynamic cone-type speakers, thin film planar loudspeakers have a critical parameter that must be optimized for proper functionality. The parameter is film diaphragm tension (See, for example, U.S. Pat. No. 4,803,733 to Carver). Proper, consistent, and long-term stable tensioning of the diaphragm in a planar device is very important to the performance of the loudspeaker. This has been a problematic area of consideration for thin-film planar devices for many years, and it is a problem in design and manufacture for current thin-film devices. Even the most carefully adjusted device can meet short-term requirements, but still can still have long-term problems with tension changes due, for example, to the dimensional instability of the diaphragm material and/or diaphragm mounting structure. Compounding this problem is force interaction within the magnet array and the supporting structure. Due to close magnet spacing of single-ended magnetic structures, the magnetic forces of the adjacent rows of magnets can interact and attract/repel each other to a greater or lesser degree depending upon the polarity relationship of the magnets and their spacing. The interaction over time can cause materials to deform; and impose changes on the film tension. This can degrade the performance of the speakers over time.

Please replace paragraph 0028 with the amended paragraph, as follows:

[0028] In a more detailed aspect, the high-energy magnets can comprise neodymium. The high energy magnets can have an energy of at least 34 ~~mGO~~ MGO. In a further more detailed aspect the diaphragm can comprise PEN, and further can a have a damping material disposed around a periphery of the active area. The conductor can be incorporated in the diaphragm and also can be coupled to the diaphragm by an adhesive.

Please replace paragraph 0065 with the amended paragraph, as follows:

[0065] The magnetic structure 35 typically comprises at least three rows of elongate magnets, with the embodiment shown in the figure having five rows of elongated magnets 35a through 35e which are placed adjacent and substantially parallel to each other. In this embodiment the magnets are of relatively high energy with each having an energy density of greater than 25 mega-Gauss-Oersteds ~~(mGO)~~ (MGO). One possible material composition of the high-energy magnets includes neodymium, with the energy density of the neodymium being at least 34 ~~mGO~~ MGO.

Please replace paragraph 0070 with the amended paragraph, as follows:

[0070] The following considerations should be taken into account, and a balance found in single-ended transducer design in accordance with the invention: (i) magnetic field interaction between the fields generated by the diaphragm coils and the fields generated by the magnetic structure 35, which depends on magnet size, strength and the magnet spacings 55; (ii) configuration(s) and material(s) of the mounting support structure 30; and, (iii) dimensional stability of diaphragm 21 when used in a transducer incorporating the very high energy neodymium magnets of greater than 25 to 34 ~~mGO~~ MGO (to values beyond 50 ~~Mgo~~ MGO), can be balanced to achieve a high performance speaker which is capable of sustaining long-term stability. Without these balanced relationships, the configuration of single-ended devices would, in the short term, and even more certainly in the long-term, interfere with the predetermined tension of the diaphragm.

Please replace paragraph 0074 with the amended paragraph, as follows:

[0074] The present invention can also be viewed as a method for maintaining a set of parameters within a range of acceptable values for operation of a single-ended planar-magnetic transducer which utilizes a thin-film diaphragm 21 with a first surface side 22 and a second surface side 23 that includes a conductive region 26. The diaphragm is positioned and spaced from a magnetic structure 35 including high energy magnets, at least 35a, 35b and 35c, of greater than 25 ~~mGO~~ MGO, preferably greater than 34 ~~mGO~~ MGO, and in one embodiment are composed of

neodymium. The parameters maintained by this method comprise (i) a proper spacing 55 between the magnets 35a through 35e, (ii) a magnet to diaphragm spacing 31, and (iii) proper ongoing diaphragm 21 tension values.

Please replace paragraph 0086 with the amended paragraph, as follows:

[0086] CP Moyen polyvinylethelene damping compound applied (Per **FIG. 17**a, b)

Please replace paragraph 0119 with the amended paragraph, as follows:

[0119] These formulas can realize a unique practical single ended planar magnetic loudspeaker in embodiments, such as shown in FIG. 4, for which a structure has been applied that can simultaneously support magnets of greater than 25 ~~mGO~~ MGO, preferably greater than 34 ~~mGO~~ MGO while being spaced to maximize distribution of magnetic energy and maintain diaphragm tension stability. This can achieved through magnet to magnet spacing that is at least 75 to 150 thousandths of an inch or at least one half of the width of one of the magnets.

Please replace paragraph 0121 with the amended paragraph, as follows:

[0121] With reference to FIGS. 11 and 12, in another embodiment further structural elements facilitate obtaining the advantages of high-energy magnets to provide performance enhancements while avoiding the previously-discussed problems that can arise. Due to the extraordinary inter-magnet forces when using very high energy magnets 35a, 35b, and 35c, such as >35 ~~mGO~~ MGO neodymium, which, as mentioned, further bracing structure 52 can be provided to keep the inter-magnet attraction and repulsion forces from distorting the main support structure 30 and therefore interfering with the tension calibration of the of the diaphragm 21.

Please replace paragraph 0123 with the amended paragraph, as follows:

[0123] Consider one embodiment having a brace structure 52a. In this case the structure is a plate abutting the magnets to hold them in place and resist their magnetic attraction. It can be seen that holes 53a through plate 52a can be provided to allow air and sound waves to pass through and the plate is at least partially acoustically transparent. In this connection, in another embodiment, as seen in FIG. 13 a bracing spacer structure ~~51b~~ 52b configured for maintaining positioning of high energy magnets 35a, 35b, and 35c can be a lattice structure that is configured to resist compressive forces while also being very open to realize a high degree of acoustic transparency. This type of structure could be used between any two magnets or between each adjacent pair of adjacent magnets when using two, three, four, five or more rows of magnets.

Please replace paragraph 0125 with the amended paragraph, as follows:

[0125] These features may also be thought of as a way for maintaining diaphragm calibration for operation of a single-ended planar-magnetic transducer which utilizes a thin film diaphragm 21 with a first surface side 22 and a second surface side 23 and includes a conductive region 26. The conductive region is positioned and spaced from a magnetic structure 35 including high energy magnets, at least 35a, 35b and 35c, of greater than 25 ~~mGO~~ MGO, preferably greater than 34 ~~mGO~~ MGO, and composed of neodymium. The calibration in this method relates to i) proper spacing 55 (FIG. 4) between the magnets 35a through 35e, ii) magnet to diaphragm spacing 31 (FIG. 4), and iii) proper diaphragm 21 tension. This includes the steps of:

Please replace paragraph 0128 with the amended paragraphs, as follows:

[0128] c) placing an inter-magnet brace/spacer structure 52 in abutting relationship to and between the adjacent magnets.

¶ It will be apparent that the foregoing steps are not in an order of execution, which can be varied. For example, a spacer might be attached to and/or around all the magnets near a top face

of each, then the magnets can be attached to the support structure, then the diaphragm is tensioned and attached, with attention to registration between the conductive areas (the traces or wires) and the magnets of the magnetic structure.

Please replace paragraph 0129 with the amended paragraph, as follows:

[0129] It should be noted that while the conductive traces 26 of the coil are shown attached to the second surface side 23 of the diaphragm 21 opposite the magnetic structure 35, they could be located on the first surface side 22 closest to the magnets. Moreover, the conductors can also be incorporated within the diaphragm, for example by forming the diaphragm of a plurality of layers with the conductive traces sandwiched between, or otherwise incorporating conductive material in the coil pattern desired within the diaphragm itself. As an example of the latter, locally treating the diaphragm film so as to make it conductive, while leaving other portions of the diaphragm non-conductive, a coil pattern of conductive material can be formed. An adhesive and metal printing method can be used to deposit the conductive traces, as will be further discussed below.
Please replace paragraph 0133 with the amended paragraph, as follows:

[0133] Another way to view the optimal spacing is wherein at least two of the adjacent high energy magnets 35a and 35b have common dimensions and the predetermined distance between them is at least one half the width of one of the magnets. Taking them to an even greater value in terms of magnet to diaphragm area ratio it is advantageous to expand the spacing to at least seventy or one hundred percent of the width of the at least one of the two adjacent magnets. This of course can be carried out with the spacing between all or a portion of the magnets, or to have variations of greater spacing between each pair. It has also been found that the depth of the magnets is optimized at values around the same as the width, and lower. In other words, the magnets are most economical when they are approximately square in cross section, or are less deep than would produce a square magnet. This is because the incremental strength increase of the magnet achieved by adding additional depth is not justified by the additional expense of the additional magnet material after about the point that the depth equals the height. It will be

appreciated that more ~~squat~~ square cross sections are generally desirable, but the magnets currently available become too breakable at some point and the lower limit on depth dimension is currently limited by materials concerns rather than an economic limit given by efficiency per unit cost. It should be noted that another constraint is getting enough coil turns in the gap for each ~~magnet~~ magnetic circuit, and therefore a wider spacing and wider magnets (relatively speaking) allowing greater conductor area (coil returns) can be quite valuable in this regard.

Please replace paragraph 0138 with the amended paragraph, as follows:

[0138] FIG. 16 shows another, though similar, structural approach which is to attach a rigid covering structure 37 to the mounting support structure 30. The rigid covering structure is configured as a curved plate which has open areas 38 and closed areas 39. The cover would substantially cover the second surface side ~~22~~ 23 of diaphragm 21. Again, the magnetic structure 35 is mounted to the mounting support structure 30 and the transducer is otherwise similar to that of FIG. 15 and those described before. The covering structure 37 would of course have acoustic transparency. Again, the curved structure is configured to resist bending of the mounting structure 30. It also protects the diaphragm from harm to some extent as it acts as a protective cage.

Please replace paragraph 0142 with the amended paragraph, as follows:

[0142] Referring now to FIGS. 17a,b, other issues related to the diaphragm 21 more specifically will be discussed. Along with the very critical parameter of diaphragm tension, another diaphragm 21 issue, related to tension and drive force relates to the behavior of an undriven ~~portions~~ portion around their periphery, between the strongly driven conductive region 26 and the termination point 21a. This undriven and/or termination area ~~20b~~ 21b can be the source of distortion and frequency response audio anomalies, particularly exacerbated by the increased drive levels associated with introducing high energy neodymium magnets to a single ended planar-magnetic transducer. It can be even more particularly applicable to one operating down to

a woofer range. It is advantageous in mitigating these anomalies to damp the diaphragm by applying a viscous or mechanical damping material 60 along at least a portion of the periphery 21a and 21b of the vibratable diaphragm 21. It can be preferable to apply this material outside of the most central portion ~~20c~~ 21c where the conductive regions 26 drive the diaphragm. It has been found that it works effectively at damping out the anomalies while not causing an appreciable negative impact due to its additional mass, when placed outside of the portion of the diaphragm having conductive areas 26 and/or outside of the outermost row of magnets 35d and 35e, on each lateral side of the magnetic structure 35. One embodiment includes a thin viscous damping material 60 which comprises a solvent-based polyurethane compound applied to the diaphragm 21 and the diaphragm can be made of polyethylenenaphthalate (PEN) film. Other viscous damping materials that have the mechanical property of high internal damping such as polyester (Mylar) would also be well suited, such as an adhesive tape having a viscous adhesive of adequate amount for damping could be used. Although PEN is one preferred diaphragm material, other diaphragm materials could be utilized, such as polyester (Mylar™) or Kapton™.

Please replace paragraph 0147 with the amended paragraph, as follows:

[0147] Turning now to FIG. 18, a further advantage that can be gained in a single-ended planar-magnetic transducer where high energy magnets are used is illustrated. A variable gap 31 between the magnet 35 faces and the diaphragm 21 allows more diaphragm excursion. The diaphragm has a central region ~~20c~~ 21c including the diaphragm region adjacent a central magnet 35a and lateral, that is to say, laterally more remote regions 21d that are a distance away from said central region ~~20c~~ 21c. The magnetic structure 35 has adjacent and lateral magnets 35b through 35e that are adjacent and more distance away from said central magnet 35a. The gap 31 between the diaphragm and the magnets of the magnetic structure 35 is greater at the central region 21c of the diaphragm which is positioned over at least one central magnet 35a, than at the remote diaphragm regions 21d which are positioned over one or more lateral, or more remote, magnets 35b and 35c and/or 35d and 35e.

Please replace paragraph 0149 with the amended paragraph, as follows:

[0149] FIG. 19 illustrates another embodiment shows an additional and compatible approach wherein the planar-magnetic transducer 100 comprises at least one thin film vibratable diaphragm 21 with a first surface side ~~21~~ 22 and a second surface side ~~22~~ 23, including a predetermined active region 25. A magnetic structure 35 including at least three central deeper and comparatively more powerful magnets 35a, 35b, 35c and additional magnets 35d and 35e of less energy is provided.

Please replace paragraph 0151 with the amended paragraph, as follows:

[0151] The magnetic structure 35 has five adjacent rows of magnets 35a-e, with at least an outer two rows of the magnets 35d and 35e being of lower total energy, by reason of being smaller, particularly, by being less deep, or by reason of being of less energy density. The outer rows thus provide less magnetic field strength than provided by a center row of the magnets 35a. This concept can be quite valuable when optimizing high energy, i.e. greater than 25 ~~mGO~~ MGO, magnets in a single-ended planar-magnetic transducer, in that the configuration can provide surprisingly more gain in efficiency for a given increase in magnetic material than what is expected. Normally, it is understood that, by increasing the magnetic energy in all the magnets in a transducer by 41% a 3 db increase in efficiency will be provided. It has been found, when just the central magnet 35a is doubled in energy level, a three db efficiency increase is available in a single-ended planar-magnetic transducer. This is an increase of only 20% of the total magnetic energy~~, or~~ less than half the theoretically predicted amount, to achieve this level of efficiency increase. This is found to be the case when doubling the magnetic density and force of a central magnet when using a high energy magnetic structure for at least the central-most magnet. The explanation comes from the ability to easily double magnetic force with small high energy magnets combined with the greater responsive mobility of the central-most area of the diaphragm compared to the outermost, more excursion-constrained areas. Therefore, by organizing the magnetic force to be greatest in the center magnet 35a and having less energy in rows going

outward toward the outermost magnets 35d and 35e, the best use of magnetic energy is provided. This can allow the cost of the magnets to be less for a given acoustic efficiency. And also, it is synergistic with the variable gap 31 approach discussed above.

Please replace paragraph 0154 with the amended paragraph, as follows:

[0154] To reiterate, increasing magnetic energy in the central area or region and decreasing gap distance between the magnets and the diaphragm 21 at the outer vibratable diaphragm ~~21~~ areas or regions can provide more acoustical efficiency, both in terms of energy use, and in cost of manufacture, for a given output. Moreover, even optimizing for the least amount of magnet cost expenditure, with high energy magnets and the design considerations discussed above, one can provide performance levels virtually unachievable with ~~a~~ an equal magnetics all across the transducer. Thus, the potential reachable with this concept utilizing high energy magnets of greater than 25 ~~mGO~~ MGO and even preferably greater than about 34 ~~mGO~~ MGO, neodymium magnets is far superior than that of prior single-ended planar-magnetic transducers.

Please replace paragraph 0155 with the amended paragraph, as follows:

[0155] With reference to FIG. 26, when applying high energy magnetics to a single ended planar-magnetic transducer it has been found by the inventors that a different magnetic design approach than is taught in the prior art can be quite advantageous. This unique design approach is illustrated in FIG. 21 wherein a planar-magnetic transducer 100 comprising at least one thin film vibratable diaphragm 21, with a first surface side 22 and a second surface side 23, includes a predetermined active region 25 and the active region including predetermined conductive surface areas 26 for converting an input electrical signal into a corresponding acoustic output. The conductive surface areas 26 including elongate conductive paths 27 running substantially in parallel with said magnets 35a through 35e. A mounting support structure 30 is coupled to the magnetic structure 35 and the diaphragm 21 to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distance 31 from the magnetic structure 35 adjacent one of the surface sides of the film diaphragm. The magnetic structure 35 includes at least three

high energy, elongated magnet rows 35a, 35b, and 35c, placed adjacent and substantially parallel to each other with each magnet having a material energy density of greater than 25 mega Gauss Oersteds and more preferably greater than 34 ~~mGO~~ MGO and comprising neodymium iron or another material of like capability in producing a magnetic field.

Please replace paragraph 0157 with the amended paragraph, as follows:

[0157] It is found by the inventors that whereas prior art planar-magnetic loudspeakers have taught the placing of the magnets very close together to achieve a maximized shared loop (see 81 in FIG. 2) this practice can be substantially improved upon when adopting a proper use of high energy magnets in accordance with the invention. In spacing the rows of magnets in the invention so that the field strength applied at the diaphragm by the local loops above each magnet is of greater magnetic energy than the shared loop centered between the two high-energy magnets, a number of advantages are derived. First, a distributed field allows the use of fewer magnets while achieving much higher outputs than the prior art. The distribution of the conductive runs on the diaphragm 21 can be distributed more effectively to have less conductive area producing direct drive of the diaphragm at the point centered between the magnets 35. This redistribution of the conductive runs 27 of the conductive areas 26 on diaphragm 21 allows a favorable impedance for the total of the conductive region/areas 26 while also distributing the drive force to more effectively drive the active region 25 of diaphragm 21. For prior single-ended planar-magnetic loudspeakers known to the inventors to function in a reasonable manner they need to be designed in an almost opposite manner from this method of optimization and use very close magnet to magnet spacing to maximize the shared field strength ~~a~~ at the center maxima 71 and concentrate the coil traces there.

Please replace paragraph 0160 with the amended paragraph, as follows:

[0160] With reference again to FIG. 26, a still further advantage of this method of magnet/conductor relative placement and field interaction optimization is the result of easing the

strong interactive forces between the magnets 35a through 35e that can cause attractions that distort the mounting support structure 30 and interfere with the calibration of the critical tensioning of the diaphragm 21 as explained above. The approach, along with bracing and other structural approaches mentioned previously, also eases the difficulty of maintaining reliability of attachment of the magnets 35a through 35e to the mounting support structure 30. The proper spacing to enhance the local loop energy near each magnet, rather than enhance the shared loop energy centered between each pair of magnets, reduces the problematic interactive forces between the magnets and creates a more reliable, extended lifetime system. This reliability advantage combined with the performance advantages provide a significant advancement in the state of the art of single-ended planar-magnetic loudspeakers. Transducers in accordance with this disclosure allow the integration of high energy neodymium magnetics without attendant drawbacks they bring with them if ~~install~~ installed in accordance with the prior art configuration discussed herein.

Please replace paragraph 0161 with the amended paragraph, as follows:

[0161] In the exemplary planar-magnetic transducer 100, high energy magnets 35 have respective local loop energy maxima ~~38~~ 78, wherein the majority of local loop energy maxima in the plane of the diaphragm 21 have an average value which is greater than an average value of energy levels at the central such as a central position 76 between corresponding adjacent poles of the adjacent magnets 35a and 35b. Some preferred values for this optimization can be expressed as preferred values wherein the shared energy maxima centered at a point 76 between a pair of magnets 35a and 35b is no greater than 90 percent of the local loop energy maxima ~~78~~ 78.1 and 78.2 nearer each magnet 35a and 35b respectively. Still further adjustments to magnet and field placement can be achieved wherein the shared energy maxima is no greater than 75 or 80 percent of the local loop energy maxima.

Please replace paragraph 0162 with the amended paragraph, as follows:

[0162] This affect can be defined wherein a predetermined distance between the local loop energy maxima points 78 for adjacent magnets 35a and 35b is approximately equal to a separation distance between the corresponding adjacent magnets 35a and 35b. In another embodiment optimization of this effect is wherein the predetermined distance between the local loop energy maxima ~~38~~ 78 for adjacent magnets is at least seventy five thousandths of an inch. Other optimizations of this effect is wherein the predetermined distance between the local loop energy maxima ~~38~~ 78 for adjacent magnets is at least ninety thousandths of an inch and at least one hundred and twenty five thousandths of an inch. Another embodiment of this inventive concept is defined wherein the predetermined distance between the local loop energy maxima 38 is at least 100 percent of the width 35w of one of the magnets 35a.

Please replace paragraph 0165 with the amended paragraph, as follows:

[0165] For best performance when optimizing for greater local loop energy, it is generally desirable to also have the conductive area comprising elongated conductive paths 27, whether singular or in group runs of 2 or more, ~~to~~ positioned so as to take maximum advantage of the local loop maxima. In one embodiment they can be centered over the local loops for maximum field force engagement with the magnetic fields from the magnetic structure 35.

Please replace paragraph 0167 with the amended paragraph, as follows:

[0167] With reference now to FIG. 20, another area of needed advancement in single ended planar-magnetic transducers is that of improving the diaphragm 21 to achieve greater thermal change and heat tolerance, high dimensional stability, and low distortion. A common diaphragm material in prior single-ended planar-magnetic loudspeakers has been polyester thin films, also known under the ~~trademarked~~ trademark name ~~MylarJ~~ Mylar ®. A limitation of such single-ended planar-magnetic loudspeakers has been reliability due to thermal problems both with the adhesives used to attach the conductive regions 26 to the diaphragm 21, and with thermal limits

of stability of the diaphragm 21 itself. Due to lower efficiency, prior systems tend to require very high power inputs to achieve significant acoustic output levels. Because of this, and the inherent thermal stability limits of such polyester thin films, prior diaphragms both had to be large, to disperse generated heat over a large area, lessening the thermal impact for any particular small part of the diaphragm 21, and more limited in maximum output for a given surface area. The inventors have found another thin-film material that has higher temperature tolerance capability, but apparently, has not been applied to single-ended planar-magnetic loudspeakers. The film material is polyamide, or Kapton™. This film has high-temperature capability and is dimensionally more stable than polyester, and in addition to conventional film materials, is useable in the transducers disclosed herein, particularly when relatively very high power applications require the highest possible thermal effects tolerance capability. Unfortunately, polyamide film does not have a high internal damping characteristic and therefore can generate higher distortion when incorporated as a thin film planar-magnetic diaphragm. Damping as disclosed herein can mitigate this undesirable trait to some extent.

Please replace paragraph 0169 with the amended paragraph, as follows:

[0169] A further advancement toward achieving higher performance is derived from advancing the methods and materials used in bonding the conductive regions 26 of the coil to the diaphragm 21. In prior devices there have been limitations due to the adhesives utilized. Undesirable traits, such as larger than desirable adhesive mass, thermal break down and letting go of conductor adhesion to the diaphragm film, ~~TV~~ UV breakdown, long curing time, and in some applications an undesirable interaction with acids used to remove unwanted portions of the conductive layer.

Please replace paragraph 0178 with the amended paragraph, as follows:

[0178] Returning to FIG. 12, and the discussion of bracing the magnetic structure, if the structure is implemented using at least one electrically conductive sheet structure 52c with acoustically

transparent areas 53a such that said sheet structure 52c has at least a surface area 53s placed between at least two rows of said multiple rows of magnets 35a and 35b and preferably interlacing in between all the rows of magnets 35a, 35b and 35c, it will mitigate the non-linearity from this cause. The plate may also have portions extending outside of the outside magnets 35b and 35c, and can serve to brace the structure 30 at spacing portions 30a and b (FIG. 11), to reduce diaphragm tension changes from creeping deformation of the structure over time as discussed above.

Please replace paragraph 0180 with the amended paragraph, as follows:

[0180] The effective application of high energy neodymium magnets can provide a surprisingly effective solution to the above stated limitation of prior art single ended planar-magnetic loudspeakers. With reference to FIGS. 4, 18, 19 and 21 using the high-energy, such as neodymium, magnets, and setting the gap 31 at a center maximum to less than one millimeter, better low frequency range response can be obtained. It can be preferable when desiring an increased ability to produce more controlled output at or near the resonant frequency, or to smooth the response through the region of the resonant frequency for more seamless interaction when crossing into a low frequency woofer system, to reduce the predetermined gap at its centered maximum to less than 0.75 millimeter or even less than 0.5 millimeter. It has been found that in addressing this problem it is preferred that magnets be of at least 35 ~~mGO~~ MGO or more.

Please replace paragraph 0182 with the amended paragraph, as follows:

[0182] It is a significant and unexpected advantage of applying high energy magnetics of greater than 25 ~~mGO~~ MGO or preferably 35 ~~mGO~~ MGO or more in accordance with the invention, that it can provide greater large signal output without the usual over-excursion problems of prior single-ended designs. In fact, it is surprising that by decreasing the magnetic gap 31, over the central portion of the diaphragm 21 of a single ended planar-magnetic transducer 100, that not

only the efficiency and damping improves, but also the large signal output capability increases. The prior approach was to expand the magnetic gap 31 so as to allow greater diaphragm 21 movement to achieve greater acoustic outputs. In the inventive system disclosed herein, a decrease of the gap from the 1 millimeter recommended previously in the prior art, to lesser values, reducing it by at least 25% to 50%, actually increases the damping and control of the diaphragm 21. Large signal capabilities are surprisingly increased; and the problem of the diaphragm 21 striking the magnet structure 35 is decreased for louder acoustic outputs over the vast majority of the operating range. This low frequency control improves the sound quality, the integration ability with woofer systems and allows greater overall system output and efficiency. This can also allow reduction in the required diaphragm 21 area of a single ended planar-magnetic transducer for the same sound pressure level as discussed in detail above. And this mitigates one of the bigger weaknesses of most prior single-ended planar-magnetic loudspeakers, which are, by necessity, typically more than about 300 square inches in diaphragm 21 area as discussed above. Incorporating features of the present invention can provide high performance transducers of less than 150 square inches of active diaphragm area 25 and a fundamental resonant frequency, and the attendant potential low frequency range, down to frequencies below four hundred Hertz. Again, as discussed in detail, above, because of the effectiveness of this method of improvement the diaphragm area can be further reduced to less than 100 square inches or even less than 30 square inches. It can also be applied such that the low frequency range is operable down to less than 800 Hz and the gap 31 is reduced down to less than 0.5 millimeters and active diaphragm area 25 is less than ten square inches.

Please replace paragraph 0185 with the amended paragraph, as follows:

[0185] In more detail and with reference to FIG. 4, for example, a tweeter embodiment can have an active diaphragm area 25 on the order of 1.5" by 2.25", and the magnet structure 35 to diaphragm ~~21~~ gap 31 can be less than 0.75 mm, preferably in the 0.20 to 0.50 mm range. This device is valuable in many applications where there has not been a single-ended planar-magnetic device effectively able to function in the past, such as in automobile sound systems, multi-media,

and home theater and now home stereo systems where wide-band Super Audio CDs are capable of 50 kHz bandwidths are demanding more extended range tweeters. Examples of the embodiments of FIGS. 24 and 25 can operate from below 500 Hz to over 50 kHz providing exemplary performance in a device that can also have the advantage of low cost. This surprising high frequency response enables application of planar magnetic speakers as a part of a parametric speaker system using ultrasonic emissions to generate audio output. This application is the subject matter of separate patent applications, U.S./PCT Serial Nos.~~______~~ 09/159,442 and 09/787,972~~Attorney Docket No. 7029~~ and continuations thereof, which are hereby incorporated by reference, and will not be discussed in detail herein.